

Rolling Knolls Landfill Superfund SITE
FIELD CHANGE REQUEST (FCR) FORM

Contract No.:

REQUEST NO: 08

DATE: 06/09/2015

FCR TITLE: Replacement of MW-13 with Pore-water Samplers

DESCRIPTION:

The Data Gaps Sampling and Analysis Plan (Data Gaps SAP) proposed installing seven permanent monitoring wells (MW-11 through MW-17). The Data Gaps SAP indicated the final locations of the permanent monitoring wells will be determined based on the results of the soil sampling and the temporary monitoring well samples collected as part of the data gap sampling. These data, and a proposal for the locations of the permanent monitoring wells, were transmitted to USEPA for review and approval on February 17, 2015. Additional supporting information was transmitted to USEPA on February 27, 2015. The USEPA responded on March 5, 2015 and requested adjustments to the locations of MW-12 and MW-15. The USEPA also requested the installation of three additional monitoring wells (MW-18 through MW-20). One of the proposed monitoring wells (MW-13) was to be located in an area later found to be inundated with water and is not a suitable location for a permanent monitoring well. Additional locations have been investigated; however, no appropriate relocation for this well has been identified. Consequently, the USEPA requested that pore-water samples be collected in place of this monitoring well.

REASON FOR DEVIATION:

Prior to installing the monitoring wells, ARCADIS personnel and a USEPA representative inspected each proposed monitoring well location. The proposed location for MW-13 was in approximately 6 to 24 inches of standing water. The location could not be moved to an area with no standing water, while still meeting the objective of delineating soil sample results from SS-157 and SS-158 (email correspondence between J. Persico and T. Mitchell on May 28, 2015). As a result, the USEPA has requested pore-water samplers be placed at the MW-13 location, shown in green on Figure 1 (email correspondence between J. Persico and T. Mitchell on June 4, 2015).

RECOMMENDED MODIFICATIONS:

Monitoring well MW-13 will be replaced with porewater samplers. Regenerated cellulose membrane samplers will be used to collect volatile organic compounds (VOCs), metals (unfiltered only) and cyanide. Additional pore-water will be collected using PushPoint techniques and analyzed for semi-volatile organic compounds (SVOCs), pesticides, and polychlorinated biphenyls (PCBs) (as Aroclors). Certain SVOCs will be analyzed by SIM to obtain a lower detection limit. Sampling procedures will follow those approved in the Quality Assurance Project Plan (approved by USEPA on December 18, 2014) using standard operating procedures (SOPs) 20 and 21 (attached). If the pumping rate in the PushPoint samplers is low, it may be difficult to retrieve all the required volume for sample analysis within a sampling period of one 12-hour field day. In that case, the following order of priority for analyses will be used (approved by USEPA on December 18, 2014 via email correspondence between S. Walls and T. Mitchell) unless otherwise noted:

1. ARCADIS PCB sample
2. USEPA PCB split sample
3. ARCADIS pesticides sample
4. USEPA pesticides split sample
5. ARCADIS SVOCs sample

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6. USEPA SVOCs split sample
7. ARCADIS duplicate sample for PCBs
8. USEPA MS/MSD for PCBs
9. ARCADIS duplicate sample for pesticides
10. USEPA MS/MSD for pesticides
11. ARCADIS duplicate sample for SVOCs
12. USEPA MS/MSD for SVOCs

ARCADIS will prepare and provide the sampling materials for the split pore-water samples for both the cellulose membrane samplers and the PushPoint samples. USEPA should provide ARCADIS with the required sample volumes for each analysis as soon as possible, as it will take approximately three weeks from receipt of that information to obtain, prepare, and deploy the membrane samplers.

IMPACT ON PROJECT OBJECTIVES:

The pore-water samples will help evaluate the concentrations of PCBs near sample locations SS-157 and SS-158. Groundwater conditions at, and in the areas surrounding, the landfill will be monitored by a network of 26 monitoring wells in total.

Dated Signatures:



06/09/2015

(Field Team Leader)



06/09/2015

(Project Manager)

Distribution:

T. Mitchell, EPA Remedial Project Manager
Quality Assurance Coordinator

RI Task Leader
Project File

Walls (Young), Suzy

From: Walls (Young), Suzy
Sent: Thursday, December 18, 2014 10:22 AM
To: 'Mitchell, Tanya'
Cc: Persico, John; Gutherz, Andrew
Subject: RE: Pore water samples

Thanks Tanya.

I also wanted to reiterate that there is no guarantee we will be able to collect enough porewater using the PushPoint samplers to obtain volume for all of these analyses. You and I discussed this before when we first proposed the PushPoint method of collection and it is also mentioned in Table 1 of the SAP. If volume is limited, we will use the following order of priority for analyses at each location, unless I hear otherwise from you:

1. Our PCB sample
2. CDM PCB split sample
3. Our pesticides sample
4. CDM pesticides split sample
5. Our SVOCs sample
6. CDM SVOCs split sample
7. Our duplicate sample for PCBs
8. CDM MS/MSD for PCBs
9. Our duplicate sample for pesticides
10. CDM MS/MSD for pesticides
11. Our duplicate sample for SVOCs
12. CDM MS/MSD for SVOCs

Thanks,
Suzy

From: Mitchell, Tanya [mailto:Mitchell.Tanya@epa.gov]
Sent: Thursday, December 18, 2014 6:17 AM
To: Walls (Young), Suzy
Subject: RE: Pore water samples

Hi Suzy,

See Response below.

Regards,

Tanya

From: Walls (Young), Suzy [<mailto:Suzy.Walls@arcadis-us.com>]
Sent: Wednesday, December 17, 2014 4:14 PM
To: Mitchell, Tanya
Cc: Persico, John; Gutherz, Andrew
Subject: RE: Pore water samples

Tanya – a few questions based on your email below.

1. PDB VOCs: PW-1 is identified as the MS/MSD location and requires 80mL total volume. PW-2 is not identified for an MS/MSD for VOCs but also requires 80mL total volume. Should PW-1 require more volume for the MS/MSD VOC sample?

Response: The VOC volume will allow for a MS/MSD. No additional volume is required.

2. PushPoint Sampling: Both locations are identified as MS/MSD locations for PCBs and pesticides but neither location is identified for SVOCs. Was that intentional? If SVOCs require an MS/MSD, how much additional volume would be needed, and at which location?

Response: Additional Volume is not required for a SVOC MS/MSD for either location.

We will wait to order PDBs until you confirm these numbers.

Thanks,
Suzy

From: Mitchell, Tanya [<mailto:Mitchell.Tanya@epa.gov>]

Sent: Wednesday, December 17, 2014 8:37 AM

To: Walls (Young), Suzy

Subject: RE: Pore water samples

Suzy,

The following sample volumes are required for the EPA split pore water samples. If you have any questions please feel free to give me a call.

Regards,

Tanya

Sample location PW-1

With MS/MSD the total PDB volume is 2100 ml, from the following:

- VOC – 2 HCL preserved vials – total volume with MS/MSD is 80 ml
- Metals and Mercury – 1 HNO₃ preserved poly – total volume with MS/MSD is 1 L.
- Cyanide - 1 NaOH preserved poly – total volume with MS/MSD is 1 L.

With MS/MSD the total volume is 7 L, from the following:

- SVOC – 1 amber unpreserved – 1 L no MS/MSD
- Pesticides - 1 amber unpreserved – the total volume with MS/MSD is 3 L.
- PCBs - 1 amber unpreserved – the total volume with MS/MSD is 3 L.

Sample location PW-2

Without MS/MSD PDB total volume is 1100 ml, from the following:

- VOC – 2 HCL preserved vials – total volume with MS/MSD is 80 ml
- Without MS/MSD Metals and Mercury – 1 HNO₃ preserved poly – the total volume is 500 ml.
- Without MS/MSD Cyanide - 1 NaOH preserved poly – the total volume is 500 ml.

With MS/MSD the total volume is 7 L, from the following:

- **SVOC** – 1 amber unpreserved – 1 L no MS/MSD
- **Pesticides** - 1 amber unpreserved – the total volume with MS/MSD is 3 L.

PCBs - 1 amber unpreserved – the total volume with MS/MSD is 3 L.

From: Walls (Young), Suzy [<mailto:Suzy.Walls@arcadis-us.com>]

Sent: Monday, December 15, 2014 2:16 PM

To: Mitchell, Tanya

Cc: Persico, John; Gutherz, Andrew

Subject: RE: Pore water samples

Hi Tanya –

Thank you for the information. Could you please confirm the actual number of samples that CDM will be collecting, including duplicate and MS/MSD samples (if any). We will also need to know at which locations they plan to collect their QA samples so we can order and install the correct number of bags. Previously we installed a different number of bags at each of the locations to account for our duplicate sample. As soon as I have the total volume needed, I will have the field crew reorder the membranes and reschedule the field deployment.

To clarify, we will be collecting VOCs and total metals, mercury, and cyanide from the passive diffusion bags. As described in the QAPP, we are not collecting dissolved metals, Hg or cyanide.

Thank you,
Suzy

From: Mitchell, Tanya [<mailto:Mitchell.Tanya@epa.gov>]

Sent: Monday, December 15, 2014 12:31 PM

To: Walls (Young), Suzy

Subject: RE: Pore water samples

Hi Suzy,

Below is the minimum volume that we can supply to the CLP laboratory for analysis.

VOC – 1 HCL preserved vial – 40 ml

Metals and Mercury – 1 HNO₃ preserved poly – 500 ml

Dissolved Metals and Mercury – 1 HNO₃ preserved poly – 500 ml

Cyanide - 1 NaOH preserved poly – 500 ml

PDBs total of 1540 ml

SVOC – 1 amber unpreserved – 1 L

Pesticides - 1 amber unpreserved – 1 L

PCBs - 1 amber unpreserved – 1 L

Pushpoint total of 3L

I have a few questions regarding the volumes that will be provided at each location. Please let me know how much volume is available to EPA for PDBs at each location and how much volume will be available for the Pushpoint samples at each location.

It is my understanding that the amount of volume for the PDBs is different for the two pore water sample locations. Please clarify or explain why this is the case.

Thanks,

Tanya

From: Walls (Young), Suzy [<mailto:Suzy.Walls@arcadis-us.com>]

Sent: Monday, December 15, 2014 11:15 AM

To: Mitchell, Tanya

Cc: Persico, John; Gutherz, Andrew

Subject: Pore water samples

Hi Tanya –

I wanted to touch base with you on the pore water collections that are scheduled for tomorrow. It was my understanding that EPA and CDM were going to contact the laboratory and determine the minimum volume of pore water needed for split samples so we could decide whether or not we needed to redeploy the pore water passive diffusion bags. We are scheduled to collect those samples tomorrow so I need to know as soon as possible if that event should be postponed. If we need to redo the pore water samplers, it will take a minimum of two weeks to order the supplies and prepare the bags – that would put us back to Dec. 29th at the earliest for deployment (provided CDM can tell us today what sample volume they will need).

Please give me a call if you would like to discuss.

Thank you,

Suzy

Suzy Walls | Project Scientist / Ecologist | suzy.walls@arcadis-us.com

ARCADIS U.S., Inc. | 114 Lovell Road, Suite 202 | Knoxville, TN, 37934

T. 865.777.3502 | M. 919.455.5413 | F. 865.675.6712

www.arcadis-us.com

ARCADIS, Imagine the result

Please consider the environment before printing this email.

Walls (Young), Suzy

From: Persico, John
Sent: Thursday, May 28, 2015 4:03 PM
To: Mitchell, Tanya
Cc: Gary M. Fisher; Draikiwicz, Michael (michael.draikiwicz@novartis.com); Brian Bergeron; Walls (Young), Suzy; 'Ricci, Richard'; Gutherz, Andrew
Subject: RE: Field Change Request Revision

Tanya – our field geologist revisited the initial proposed location of well MW-13. The proposed location and surrounding areas, including the area of soil samples SS-157 and SS-158, are under at least 6 inches of water. In some areas, up to 2 feet of water was observed. Therefore, we do not believe that a monitoring well can be installed near or downgradient of soil sample locations SS-157 and SS-158.

We propose to complete the Data Gaps SAP without installing well MW-13. We can document the field conditions in the final report. Let us know if you approve this change.

From: Mitchell, Tanya [<mailto:Mitchell.Tanya@epa.gov>]
Sent: Wednesday, May 20, 2015 3:31 PM
To: Walls (Young), Suzy
Cc: Persico, John; Gary M. Fisher; Draikiwicz, Michael (michael.draikiwicz@novartis.com); Brian Bergeron
Subject: RE: Field Change Request Revision

Suzy,

Thank you for taking the time to re-evaluate the proposed location. I will wait for your findings.

Thanks,

Tanya

From: Walls (Young), Suzy [<mailto:Suzy.Walls@arcadis-us.com>]
Sent: Wednesday, May 20, 2015 2:54 PM
To: Mitchell, Tanya
Cc: Persico, John; Gary M. Fisher; Draikiwicz, Michael (michael.draikiwicz@novartis.com); Brian Bergeron; Ricci, Richard F.; Gutherz, Andrew
Subject: RE: Field Change Request Revision

Tanya,

I understand your concern. We are trying to get our field crew to go to the original location (proposed in the Interim Report) as well as SS-157 and SS-158 now. The CDM representative is also onsite and will be there to verify. I am not optimistic that these locations will be dry either, given that they were pretty saturated a few months ago, but I will keep you posted on what we hear.

Thanks,
Suzy

From: Mitchell, Tanya [<mailto:Mitchell.Tanya@epa.gov>]
Sent: Wednesday, May 20, 2015 11:57 AM
To: Walls (Young), Suzy

Cc: Persico, John; Gary M. Fisher; Draikiwicz, Michael (michael.draikiwicz@novartis.com); Brian Bergeron
Subject: RE: Field Change Request Revision

Suzy,

The purpose of MW-13 is to provide “monitoring in vicinity of PCBs detected in soil samples SS-157 and SS-158.” Based on the attached figure with the new proposed location, it is not clear how this location will monitor the PCBs in the targeted soil area.

It may be more advantageous to revisit the original proposed location to determine if there is another location in the vicinity that allows for PCB monitoring. It is recommend that the area is revisited to determine a more suitable location, if possible.

Regards,

Tanya

From: Walls (Young), Suzy [<mailto:Suzy.Walls@arcadis-us.com>]

Sent: Wednesday, May 20, 2015 10:55 AM

To: Mitchell, Tanya

Cc: Persico, John; Gary M. Fisher; Draikiwicz, Michael (michael.draikiwicz@novartis.com); Brian Bergeron; Ricci, Richard F.; Gutherz, Andrew

Subject: RE: Field Change Request Revision

Attached is a figure showing the proposed location. The condition at the original location (shown in grey) was previously dry enough for well installation but is currently under 6 to 12 inches of standing water. The field crew and CDM representative had to move approximately 150 feet west, into the landfill, in order to find the nearest dry location.

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Can you provide some additional detail of the proposed new location for MW-13? Where are you proposing to move the MW from the location identified in FCR-06? This information will be helpful to determine if a FCR is needed.

Thanks,

Tanya

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Tanya,

I spoke with the field crew this evening and have been informed that two monitoring well locations (MW-13 and MW-14) previously adjusted in FCR-06 (approved on April 27, 2015) are now located in standing water. The crew identified alternative locations for these two wells. The CDM representative was present during these evaluations.

Would you like to see the revised locations in a third revision to FCR-06 or would you prefer a new field change request for the relocation of these wells?

Thanks,
Suzy

Walls (Young), Suzy

From: Mitchell, Tanya <Mitchell.Tanya@epa.gov>
Sent: Thursday, June 04, 2015 8:13 AM
To: Persico, John
Cc: Gary M. Fisher; Draikiwicz, Michael (michael.draikiwicz@novartis.com); Brian Bergeron; Walls (Young), Suzy
Subject: Rolling Knolls MW-13 installation

Confirmation of this email is requested.

Thank you for taking the time to canvas the area for a more suitable location. It appears that a MW is not feasible for the proposed location. EPA recommend pore water samples be installed instead of the MW. The pore water samples will provide monitoring in vicinity of PCBs detected in soil samples SS-157 and SS-158.

Should you have any questions or concerns regarding this email, please notify me within three days of receipt of this email.

Regards,

Tanya

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Subject: RE: Field Change Request Revision

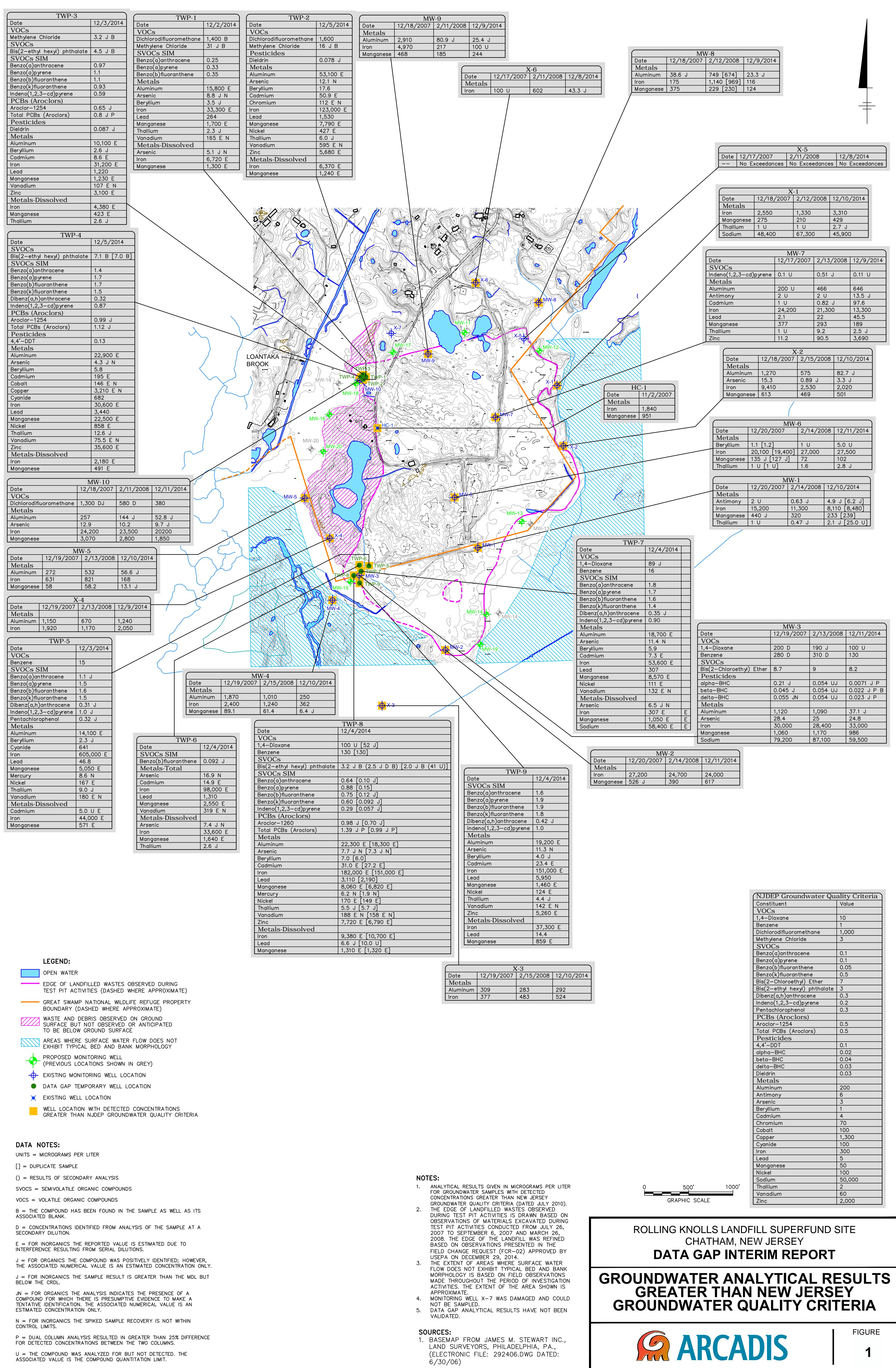
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Thanks,
Suzy

XREFS: IMAGES: PROJECTNAME: ----
33203X01
B0033203X15
B0033203XPD



**Standard Operating
Procedure: Porewater
sampling using an *in-situ*
dialysis membrane sampling
apparatus**

Rev. #: 0

Rev Date: February 8, 2013

Rev. #: 0 | Rev Date: February 8, 2013

Approval Signatures

Prepared by: _____

Date: 13 February 2013

Prepared by: _____

Date: 13 February 2013

Reviewed by: _____

Date: 13 February 2013

(Technical Expert)

Rev. #: 0 | Rev Date: February 8, 2013

I. Scope and Application

Porewater sampling will occur to assess concentrations of dissolved-phase constituents in sediment of Operable Unit E (OU-E) ponds at the Former Georgia Pacific Wood Products Facility in Fort Bragg, CA. Field personnel will install diffusion controlled *in-situ* dialysis membrane porewater samplers (DMPS) to collect data. De-oxygenated, de-ionized (DI) water will be placed inside of the dialysis membrane and the sampler will be installed in the 0-0.5 ft. below sediment surface (bss) depth interval of the surficial sediment. The sampler will be left in the sediment for a minimum of 12 days to allow for the constituent concentrations in the sampler to reach equilibrium with surrounding porewater and no more than 14 days to reduce potential for degradation of the dialysis membrane. DMPS allow for the analysis of *in-situ* conditions and reduce the influence of sampling artifacts (e.g., oxidation and temperature) on data collection.

II. Personnel Qualifications

ARCADIS field personnel will have current health and safety training, including 40-hour HAZWOPER training, site supervision training, and site-specific health and safety training. In addition, personnel overseeing, directing, or supervising sediment collection will be versed in the applicable Standard Operating Procedures (SOPs) to successfully complete the sampling activities and be experienced with general sampling methods used in aquatic environments (e.g., sediment, surface water, an/or porewater).

III. Equipment List

The following equipment will be required during *in-situ* pore water sampling activities:

- Personal protective equipment (PPE) and safety equipment as required by the site health and safety plan (HASP) and Job Safety Analysis (JSA).
- *In-situ* DMPS:
 - 5 inch (in.) x 1 in. (Length (L) x inner diameter (ID)) slotted PVC pipe;
 - Acetate cellulose tubular dialysis membrane (ACDM; 8,000 dalton nominal molecular weight cutoff) cut into 15 in. strips with stainless steel or ceramic scissors;
 - 2 in. outer diameter closed pipe nipples;
 - Rubber stop corks;
 - 8 in. x 2.0 in. (L X ID) protective slotted PVC sheath;

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- Manufactured DMPS sampling apparatus (top and bottom push-rod/anchor made out of slotted PVC and plexiglass “snowshoe”);
- Stainless steel or ceramic scissors;
- 50 milliliter (mL) pipette and pipette bulb;
- 5 gallon buckets with lid and air lock;
- Laboratory grade helium or nitrogen tank (including regulator and necessary hoses);
- Air stone;
- GPS equipment with sub-meter accuracy and sample locations entered;
- Chest waders;
- Boat (aluminum Jon boat and lightweight inflatable);
- Field probe with capabilities to measure oxidation-reduction potential (ORP), dissolved oxygen (DO), temperature and pH;
- Slide hammer;
- Hand auger with 1.5 in. screw head;
- Laminated site location map (with sample locations marked);
- Laboratory supplied sample containers;
- Indelible ink pen and ball point pen;
- Transport cooler(s) with ice;
- Laboratory supplied DI water;
- Field log book;
- Digital camera;
- Sample labels;
- Canopy and stakes/weights;
- Decontamination supplies (see Field Sampling Equipment Decontamination Procedures SOP, No. 1213199) and;
- Sample packaging and shipping supplies (see Field Sample Packing, Handling and Shipping SOP, No 1223199)

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IV. Cautions

Helium/nitrogen tanks must be delivered to the site by an appropriate agent complying with Materials of Trade, Department of Transportation, and/or International Air Transport Association regulations, as necessary. Helium/nitrogen tanks must be stored and transported on-site in compliance with appropriate Materials of Trade and health and safety regulations.

If inclement weather occurs, then sampling must be conducted under cover to prevent potential contamination of porewater samples by rainwater.

To prevent oxidation of the porewater samples, the deployment and retrieval procedures must take place as quickly as possible, and agitation of the sampler should be minimized during deployment and retrieval.

If DMPS are to be used to sample for VOCs, then packing tape must be avoided on the sample containers to prevent contamination. If DMPS are to be used to sample for metals, then stainless steel or ceramic tools should be used to prevent contamination.

If a slide hammer must be used to insert the DMPS into the sediment, use caution as to not damage the sampling device. Use the hammer as gently as possible and position as best as possible in areas clear of debris and rocks.

To the extent possible, store and/or stage empty and full sample containers and coolers out of direct sunlight and under ice.

Be careful not to spill laboratory-prepared containers that may contain preservatives. Reduction of the preservative in the container may impact the integrity of the sample and analytical results and is a health and safety concern.

Shipping determinations must be made for samples to be collected prior to mobilization for the field event, and appropriate measure must be taken to ship the samples in accordance with Department of Transportation, and/or International Air Transport Association regulations.

V. Health and Safety Considerations

Always review and follow site specific SOPs and consult the site-specific HASP and JSAs.

Wear appropriate PPE and have safety equipment specified by the site HASP and JSAs. Use caution when transporting boats and working over water.

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Follow appropriate health and safety standards and regulations for storing and transporting compressed gas cylinders.

VI. Procedure

Sampling devices will be custom manufactured and are modified based on methods described by Vrobleski et al., (2002).

Probe assembly:

1. Don PPE as specified by the HASP and JSA.
2. Decontaminate DMPS pieces and 5 gallon buckets to be used to hold DMPS during deoxygenation.
3. Place laboratory supplied DI water into the previously decontaminated 5 gallon buckets.
4. Assemble helium tank with regulator, hoses and air stone at end of discharge hose. Slowly turn on gas release valve to gauge appropriate pressure (i.e., seals and hoses maintain integrity) and evaluate potential leaks. If pressure is too high or if leaks are present, then turn off regulator and adjust tubing. Repeat this step as necessary to achieve appropriate pressure and stop leaks.
5. Bubble helium gas into a sufficient number of the DI filled buckets to hold all DMPS for the event until the dissolved oxygen (DO) concentration falls below 0.5 mg/L as measured by a calibrated field probe (see Measuring Basic Water Quality Parameters In-Situ SOP, No 1343199). Keep remaining DI filled buckets for the following step.
6. Label two buckets filled with DI water “1st rinse” and “2nd rinse”.
7. Cut strips of ACDM to lengths of approximately 15 in. using scissors and dip the strip twice into the bucket labeled “1st rinse” and twice into the bucket labeled “2nd rinse” to remove any residual packing solution.
8. Insert the 5 in. x 1 in. (L x ID) slotted PVC pipe into ACDM and tie an overhand knot at one end of the ACDM.
9. Submerge the ACDM into the de-oxygenated, DI water, making sure that the bag is completely filled. Tie an overhand knot on the loose end of the sampler

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to seal the bag. Turn the ACDM upside down to make sure that it is completely sealed.

10. Place the ACDM inside of its protective sheath (to create the DMPS); making sure that the sampler remains submerged in the de-oxygenated DI water. Screw on PVC nipples, with rubber stop cork previously inserted, to both ends of the DMPS. Keep the DMPS in the de-oxygenated, DI water with continuous helium bubbling until deployment.

Sampler deployment:

1. Don PPE, as required by the HASP and JSAs. If necessary, deploy the boat into the water body where sampler will be installed. Follow the boat deployment, trailering, and transport JSA when handling the boat.
2. Use GPS survey equipment to locate the proposed sample location. If sample location must be relocated from the pre-determined locations, then field staff must contact the Task Manager and/or Project Manager to discuss potential relocation of the location. Survey and document field modifications to sample locations, when necessary, and note reasons for the modification in the field notebook.
3. Identify the proposed sample location in the field notebook, along with other appropriate information collected during sediment sampling activities (i.e., texture, color, presence of debris, presence of oily sheen, and presence of organic matter, and odor; see Sediment Sampling with Dewatering SOP, No 1383199a).
4. Record the sampling location and station position with the GPS.
5. Submerge calibrated field probe (with push-rod if necessary) into the surficial sediment and record ORP, DO, temperature, and pH. Be careful not to force the probe, which may result in breakage of the sampling equipment. Record measurements in field notebook.
6. If sediment collection activities are proposed at the sample location, sediment samples will be collected directly adjacent to the area of porewater collection prior to porewater sampler deployment to prevent disturbance of the surface sediment that may occur during the porewater sampler deployment/retrieval process.

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7. On shore (or onboard the boat if used), remove the DMPS from the de-oxygenated, DI water and attach to the spike and push-rod pieces of the sampling apparatus by screwing the pieces together.
8. Lower the sampling apparatus through the water column until it reaches the sediment surface (as judged by field staff using a sediment probe with a flat head).
9. Once the sediment surface is encountered, mark the distance on the sampling apparatus with permanent marker above the water surface that is equal to the distance between the bottom of the sampling apparatus and 1 in. above the top of the DMPS.
10. Insert the sampling apparatus perpendicular into the sediment until the mark made in step 8 is level with the water surface of the water.
11. If the sediment is too compact to direct push the sampling apparatus, then gently use a slide hammer to install the sampler to its appropriate depth. If the sampling apparatus will not install gently using a slide hammer, then dig a pilot hole using a 1.5 in. diameter screw head hand auger before perform the sampling apparatus final installation.
12. After the sampler has been inserted to its appropriate depth, place the weighted plexiglass “snow-shoe” on top of the DMPS by sliding in onto the push-rod and making sure that it encounters the sediment surface by probing with a piece of PVC.
13. Repeat steps 6 through 11 to deploy DMPS with sufficient volume to meet analytical needs.

Sampler retrieval:

1. Don PPE, as required by the HASP and JSAs. Identify the sample location in the field notebook.
2. Use GPS survey equipment, as well as visual inspection of the push-rod, to accurately locate the original sample location.
3. Record changes of the sampler location from the initial placement, as necessary, with the GPS.

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4. Submerge calibrated field probe (with push-rod if necessary) into the surficial sediment and record DO, pH, oxidation-reduction potential (ORP) and temperature. Record measurements in field notebook.
5. Remove the sampling apparatus by slowly pulling the push-rod. Disassemble the DMPS from the sampling apparatus and pour as much residual sediment inside the spike and/or push-core back into the pond, directly above the location from which it was removed.
6. Bring the sampling apparatus to a stable platform (e.g., boat deck or shore), taking care not to agitate the device to prevent oxidation of the porewater samples. Sampling location should be under a canopy or cover, if necessary, dependent on weather (see Section IV of this SOP).
7. Un-screw the segments of the DMPS and remove the ACDM as soon as possible following retrieval; sampling of the DMPS should begin within 20 minutes of retrieval to prevent oxidation of the sample and precipitation of metals from solution. Dip the ACDM into a bucket of DI water to remove gross adsorption of sediment particles. Cut the knot off of the ACDM and pipette sample into laboratory supplied sampling containers, making sure not to place any residual sediment into the sample container.
8. Place push-core and spike into appropriate location for decontamination procedure.

VII. Waste Management

Materials generated during the sediment sampling and decontamination activities along with disposable equipment will be transported for off-site disposal in accordance with project requirements and applicable State regulations.

VIII. Data Recording and Management

Daily sampling activities will be recorded in the field notebook. Photographs of sampling apparatuses and field activities will be taken as appropriate, and photographs taken will be recorded (e.g., subject matter, photograph location, and photograph facing) in the field notebook. Copies of the field notebook will be forwarded to the Project Manager or designee, as requested. Upon completion of the field activities, field notebooks will be maintained in the project files.

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IX. Quality Assurance

Field-derived quality assurance blanks will be collected as specified in the Work Plan, depending on the project quality objectives. There will be one method blank carried out on a DMPS apparatus for the de-oxygenated, DI water procedure. There will be another method blank carried out each day of the retrieval process on the scissors used to cut the ACDM.

X. References

Vrobleski DA, Petkewich MD, and Campbell TR. 2002. Field Tests of Diffusion Samplers for Inorganic Constituents in Wells and at a Groundwater-Discharge Zone. United States Geological Survey. Water Resources Investigations Report 02-4031.



Pore-water sampling using a direct push sampling apparatus

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Approval Signatures

Prepared by: *Amber Stojak* Date: 12/11/2014

Reviewed by:  Date: 12/11/2014
(Technical Expert)

Reviewed by: *John Persson* Date: 12/11/2014
(Project Manager)

I. Scope and Application

This Standard Operating Procedure (SOP) describes the general procedures for collecting pore water samples.

The direct push (e.g., slotted PVC pipe with a bailer) sampling method will be the primary method used to collect pore water samples for the analysis of polychlorinated biphenyls (PCBs) as Aroclors, pesticides, and semi-volatile organic compounds (SVOCs). If the sediment bed cannot be penetrated to the desired depth by screen sampler apparatus due to large cobbles, boulders, or bedrock, the sample location will be relocated to an adjacent location and a note made in the field notebook about the refusal and location. Three attempts should be made to achieve the desired collection depth interval before abandoning a sample location. The sample will be collected from the 0.5 to 1ft interval of sediment. The direct push sampling device consists of a 6 inch slotted pipe section (0.01 inch slots cut into the PVC pipe to allow porewater entry) that is threaded to a non-slotted PVC pipe as a riser above the sediment-water interface. The PVC pipe will be driven through a plastic flange, located at the sediment-water interface, to avoid surface water entering the sampler. The porewater will enter the PVC pipe via the slots and will be purged via a peristaltic pump and tubing (to eliminate any potential surface water that may have entered while submersing the sampler). Laboratory samples will be collected using a bailer.

This SOP may change depending upon field conditions, equipment limitations, or limitations imposed by the procedure. Substantive modification to this SOP will be approved in advance by the Project Manager, as well as a Technical Expert.

II. Personnel Qualifications

ARCADIS field personnel will be versed in the relevant SOPs and will possess the skills and experience necessary to successfully complete the desired field work.

III. Equipment List

The following equipment list contains materials that may be needed in carrying out the procedures contained in this SOP. Not all equipment listed below may be necessary for a specific activity. Additional equipment may be required, pending field conditions.

- personal protective equipment (as required by the HASP)
- event Sampling and Analysis Plan (SAP)
- project Quality Assurance Project Plan (QAPP)

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- global positioning system unit (GPS) with submeter accuracy
- appropriate sample containers, labels, and forms
- Decontamination supplies (see the SOP for Decontamination).
- Direct push sampler(s). A direct push apparatus consisting of PVC (non-slotted bottom, slotted 6 inch interval, non-slotted riser top).
- Peristaltic pump with appropriate power source.
- A secondary container for protection of pump from water and wrapping material to protect the electrical connection parts.
- Dedicated Tygon® tubing (or other type as specified by the manufacturer) will be used through the pump apparatus.
- Teflon® tubing or Teflon®-lined polyethylene tubing of an appropriate size and tube connectors to attach from the Teflon tubing to the smaller section of Tygon pump tubing.
- YSI water-quality meter (temperature/pH/specific conductivity/oxidation-reduction potential/turbidity/dissolved oxygen or as applicable)
- clamp rings (as applicable)
- Bailing device
- Screen sock for slotted PVC (if needed; to trap silt from entering sampler)
- surveyor's rod (or other applicable water depth measuring device)
- electrical tape
- zip ties (appropriate size as applicable)
- trash bags
- pin flags (or other location markers as applicable)
- indelible ink markers
- digital camera

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- appropriate transport containers and packing, labeling, and shipping materials (coolers) with ice
- field notebook
- stainless steel shovel/trowel
- stainless steel trimming shears

IV. Cautions

The selection of sampling equipment and methodology should be made based on the constituents of concern, sampling objectives, and site conditions.

- Do not use permanent marker or felt-tip pens for labels on sample container or sample coolers – use indelible ink. The permanent markers could introduce volatile constituents into the samples.
- Prevent contact of water with the peristaltic pump, batteries, or any electrical connections by placing pump or batteries in a container and wrapping electrical connections.

VI. Procedure

Direct Push

1. Prior to entering the field, assemble the direct push sampler.
2. Don personal protective equipment (as required by the HASP).
3. Identify the proposed sample location in the field notebook, including other appropriate information collected during pore water sampling activities.
4. Upon arrival at sample location, record location coordinates with GPS.
5. Secure a screen sock over the slotted interval (if fine silt is present in sediments). Use a metal clamp or zip ties to bind screen sock to the sampler.
6. Place a marker (e.g., electrical tape) on the sampler to identify how far to insert the sampler into the sediment. Using the measured water depth (if surface water is present), add the desired insertion depth (i.e., 1 foot below sediment surface [bss])

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and mark that point on the sampler (i.e., if the water depth is 1.0 foot and collection depth is 1 foot bss, the marker would be placed 2 feet from bottom of the screen on the sampler).

7. Remove any vegetation clusters using a shovel or shears to cut, trim, or scrape off the vegetation until a relatively flat surface is obtained.
8. Place a plastic flange over the target sampling area and press down into the sediment until it is flush with the sediment surface.
9. Lower the sampler through the flange and into the sediment until it just reaches the top of sediment. Gently press the sampler into the sediment by hand using a slight twisting motion and slowly drive the sampler into the sediment until the targeted depth is achieved.
10. Once the desired depth is achieved, insert the Teflon® tubing into the PVC pipe and associated peristaltic pump.
 - Withdraw water using a peristaltic pump at a low-flow sampling rate (50 to 200 milliliters per minute).
11. Slowly draw the water up into the tubing. This effort may require multiple attempts for the water to pass through sediment.) Purge the volume equal to the PVC sampler to collect less turbid pore water.
12. Using the YSI meter, measure general water quality parameters, including turbidity.
 - In the event turbidity is greater than 200 NTU, the samples will be labeled and instructions sent to the laboratory to filter samples.
13. Once purging is complete samples can be collected.
 - SVOC samples will be collected using a bailer; PCBs as Aroclors and pesticides will be collected using a bailer or peristaltic pump and tubing.
 - Tether a cord attached to the handle at the top of the bailer and lower into the PVC pipe. Allow the weight of the bailer to sink into the fluid and retrieve using the tether.
 - Withdraw water using the Teflon® tubing and peristaltic pump at a low-flow sampling rate (50 to 200 milliliters per minute). Slowly draw the water up into the tubing.

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- Avoid overfilling sample containers to prevent preservatives, if present, in sample container from being lost
14. For SVOC samples, tilt the sample bottle when filling to reduce aeration. Check the filled vial for bubbles and refill a new sample container if bubbles are present.
 15. For all other samples (PCBs as aroclors and pesticides) tilt the sample bottle when filling but re-sampling is not necessary if bubbles are present.
 16. Label sample containers in accordance with the procedures presented in the QAPP.
 17. Once the sample is collected in the appropriate container(s), place on ice in a cooler.
 18. Record appropriate information in the field notebook.
 19. Collect duplicate samples and other quality control samples (e.g., rinsate, equipment blanks) as required by the QAPP.
 20. Fill out the chain of custody form and handle, pack, and ship the samples in accordance with the procedures described in the SOP-9.

VII. Waste Management

Investigative-derived waste generated during the sampling activities and disposable equipment will be transported via a bucket or other sealed container for offsite disposal and transferred to a labeled and dated Department of Transportation (DOT)- approved 55-gallon drums.

VIII. Data Recording and Management

All sample and location measurements and observations will be maintained in a field notebook or log. Photographic logs will also be compiled to document field activities and site locations. Upon project completion, field notebooks will be forwarded to the Project Manager for storage in the project files.

IX. Quality Assurance

Samplers will forward copies of field notes and chains of custody to the Project Manager for quality assurance checks during project implementation at a frequency determined by the Project Manager.

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Sample quality will be achieved by complying with the procedures outlined in this SOP and by following site-specific plans. Cross-contamination will be prevented by following the protocols described in the QAPP or SOP for Field Equipment Decontamination. Field activities will be supervised by appropriate experienced field supervisors. Additional quality assurance information is presented in the project-specific QAPP.